Acid-Base Problems

Step 1: Look at the pH to identify the primary disorder:

>7.4 = alkalosis <7.4 = acidosis

If pH and PCO2 move in the same direction, primary disorder is metabolic

If pH and PCO2 move in opposite directions, primary disorder is respiratory

For primary respiratory issues, linear relationship between pH and PCO2:

pH 7.4 PCO2 40

pH 7.5 PCO2 30

pH 7.3 PCO2 50

Step 2: Is there appropriate compensation?

Acute **respiratory alkalosis:**

* HCO3 down by 2 for every 10mmHg decrease in PCO2
* Expected pH = 7.4 + (.008 x change PCO2)

Chronic **respiratory alkalosis:**

* HCO3 down by 5 for every 10mmHg decrease in PCO2
* Expected pH = 7.4 + (.003 x change PCO2)

Acute **respiratory acidosis**

* HCO3 up by 1 for every 10mmHg increase in PCO2
* Expected pH = 7.4 –(.008 x change PCO2)

Chronic **respiratory acidosis**:

* HCO3 up by 4 for every 10mmg increase in PCO2
* Expected pH = 7.4- (.003 x change PCO2)

**Metabolic Acidosis**:

Expected PCO2 = (1.5 x HCO3) + 8 (+/-2)

**Metabolic Alkalosis**:

Expected PCO2 = (0.7 x HCO3change)

Step 3: Check the gap:

* Measure the anion gap: Na+ - (Cl + HCO3) 🡪 AG = 12 +/-4
* If albumin < 4 🡪 AG + x (4-albumin) x = 2.5 g/dl or .25 g/L

Step 4: Check the **delta gap ratio:**

* + AG-12/24-HCO3
  + <0.4 = hyperchloremic metabolic acidosis
  + 0.4-0.8 = gap and non-gap acidosis
  + 1-2 high AG alone (decrease in HCO3 approx increase in gap)
  + >2 additional metabolic alkalosis or chronic resp acidosis

Problems:

1. 60 yo F admitted with diarrhea

ABG: 7.31/33/74 Chem: 135/2.9 113/16 40/1.8 albumin 3.9

2. Patient arrives after being found down

ABG: 6.85/82/200 135/4 105/8 23/1.1

3. 62 yo F with h/o DM, HTN presents obtunded

ABG: 7.41/32/82 142/2.7 118/8 33/1.9 glucose 500